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In re Application of: **Pomeranz**Serial No.: **10 / 533,321**Filed: **May 2, 2005**For: **Thulium Pumped Laser  
Mid-IR Source**§  
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§Attorney Docket No.: **20030016**Confirmation No.: **5294**Examiner: **Carter, Michael W.**Art Unit: **2828**

The following amended claims incorporate changes suggested by Examiner in a fax to inventor's attorney on January 13, 2010. In addition, to the changes suggested by the Examiner to independent claims 1, 5, 9 and 19, claims 11, 13, 21 and 23 should be cancelled due to the changes made to the independent claims.

1. (currently amended) A method of pumping a wide bandwidth optical parametric oscillator to provide mid-IR radiation output, comprising the step of pumping the optical parametric oscillator with a Thulium laser using a laser wavelength of about 2 microns and operating by itself as a pump source for the optical parametric oscillator, wherein the optical parametric oscillator includes two zinc germanium phosphide non-linear crystals, [and] wherein each of the crystals generates a signal beam and an idler beam that are all part of the output from the optical parametric oscillator, and wherein the signal beams and idler beams generate four distinct wavelengths.

2. (original) The method of Claim 1, wherein the Thulium laser utilizes a YAlO<sub>3</sub> host.

3. (previously cancelled)

4. (original) The method of Claim 1, wherein the Thulium laser is Q-switched.

5. (currently amended) A method of pumping an optical parametric oscillator without utilizing Holmium, comprising the step of pumping the optical parametric oscillator with a Thulium laser using a laser wavelength of about 2 microns output, wherein the optical parametric oscillator includes two zinc germanium phosphide crystals, and wherein each of the crystals generates a signal beam and an idler beam, [and] wherein each of said crystals generates a signal beam and an idler beam that are all part of an output from the optical parametric oscillator, and wherein the signal beams and idler beams generate four distinct wavelengths.

6. (previously cancelled)

7. (previously cancelled)

8. (previously cancelled)

9. (currently amended) Apparatus for generating infrared radiation, comprising the combination of:

a Thulium laser using a laser wavelength of about 2 microns; and,  
an optical parametric oscillator pumped by said Thulium laser, wherein said optical-parametric oscillator is in the form of a ring, wherein said optical parametric oscillator includes two  $\text{ZnGeP}_2$  non-linear crystals, and wherein the two  $\text{ZnGeP}_2$  non-linear crystals are configured to generate four distinct wavelengths.

10. (original) The apparatus of Claim 9, wherein said Thulium laser is a  $\text{Tm:YAlO}_3$  laser.

11. (cancelled)

12. (previously cancelled)

13. (cancelled)

14. (previously cancelled)

15. (original) The apparatus of Claim 9, wherein said optical parametric oscillator is doubly resonant.

16. (original) The apparatus of Claim 9, wherein said optical parametric oscillator has a non-linear crystal selected from the group consisting of zinc germanium phosphide, silver gallium selenide, silver gallium indium selenide, gallium arsenide and lithium niobate crystals.

17. (original) The apparatus of Claim 9, wherein said Thulium laser is selected from the group consisting of YAG, YSGG, PALO, LuAG, YU,  $\text{Y}_2\text{O}_3$  and  $\text{YVO}_4$  Thulium lasers.

18. (original) The apparatus of Claim 9, wherein the optical parametric oscillator has a non-linear crystal selected from the group consisting of  $\text{ZnGeP}_2$ ,  $\text{AgGaSe}_2$ ,  $\text{AgGaS}_2$ ,  $\text{OPGaAs}$  and  $\text{PPLN}$  non-linear crystals.

19. (currently amended) Apparatus for generating infrared radiation, comprising the combination of:

a Thulium laser using a laser wavelength of about 2 microns; and,  
an optical parametric oscillator pumped by said Thulium laser wherein said optical parametric oscillator is double resonant, wherein said optical parametric oscillator includes two  $\text{ZnGeP}_2$  non-linear crystals, and wherein the two  $\text{ZnGeP}_2$  non-linear crystals are configured to generate four distinct wavelengths.

20. (original) The apparatus of Claim 19, wherein said Thulium laser is a  $\text{Tm:YAlO}_3$  laser.

21. (cancelled)

22. (original) The apparatus of Claim 21, wherein said optical parametric oscillator is in the form of a ring.

23. (cancelled)

24. (original) The apparatus of Claim 21, wherein said optical parametric oscillator is in the form of a linear resonator.